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ORIGINAL ARTICLE
ORİJİNAL ARAŞTIRMA

Comparison of Functional Capacity with Reference Values Using the 6-Minute Walk Test in Patients with Juvenile Idiopathic Arthritis

Juvenil İdiyopatik Artritli Hastalarda 6 Dakika Yürüme Testi İle Fonksiyonel Kapasitenin Referans Değerlerle Karşılaştırılması

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ABSTRACT

Aim: Evaluating the walking capacity of patients with juvenile idiopathic arthritis (JIA) is important to understand disease progression and to determine treatment efficacy. This study aims to investigate the walking capacity of JIA patients and to explore potential factors affecting their performance.

Material and Method: A total of 30 JIA patients were enrolled between January 2023 and March 2023; as one patient could not complete the 6-minute walk test due to leg pain, analyses were performed on 29 patients. Before and after the test, the patients' pulse, oxygen saturation, and blood pressure values were recorded.

Results: Among the patients, 16 (55.2%) were female. The median age was 14.7 years (range: 8-19 years), and the median age of disease onset was 9.3 years (range: 1-17 years). The distribution of patients by JIA subtype was as follows: 22 (75.9%) had oligoarticular JIA, 5 (17.2%) had enthesitis-related arthritis, 1 (3.4%) had RF-positive polyarticular JIA, and 1 (3.4%) had psoriatic arthritis. The mean walking distance achieved by the patients was 536.8±80.8 meters. The patients walked 73.7-102.5% of the walking distances predicted in the literature, and a significant decrease in walking capacity was found.

Conclusion: This study suggests reduced walking capacity among JIA patients relative to published reference values. A lower walking capacity was observed in patients receiving treatment compared with those in remission, although this finding may be influenced by confounding by indication and should be interpreted with caution. These preliminary findings support further investigation into the potential value of physical activity as an adjunct to medical treatment in JIA.

Keywords: Juvenile idiopathic arthritis, pediatric rheumatology, six-minute walking test, functional capacity

ÖZ

Amaç: Juvenil idiyopatik artritli (JİA) hastaların yürüme kapasitelerinin değerlendirilmesi, hastalığın ilerleyişini anlamak ve tedavi etkinliğini belirlemek açısından önemlidir. Bu çalışmanın amacı, JİA hastalarının yürüme kapasitelerini incelemek ve performanslarını etkileyebilecek potansiyel faktörleri araştırmaktır.

Gereç ve Yöntem: Çalışmaya Ocak 2023-Mart 2023 tarihleri arasında 30 JİA hastası dahil edildi; bir hasta bacak ağrısı nedeniyle testi tamamlayamadığından analizler 29 hasta üzerinden yapıldı. Testten önce ve sonra hastaların nabız, oksijen satürasyonu ve kan basıncı değerleri kaydedildi.

Bulgular: Hastaların 16'sı (%55,2) kızdı. Ortanca yaş 14,7 yıl (dağılım: 8-19 yıl) ve hastalık başlangıç yaşı ortanca 9,3 yıl (dağılım: 1-17 yıl) idi. JİA alt tiplerine göre dağılım şu şekildeydi: 22 hasta (%75,9) oligoartiküler JİA, 5 hasta (%17,2) entezit ilişkili artrit, 1 hasta (%3,4) RF pozitif poliartriküler JİA ve 1 hasta (%3,4) psöriatik artrit tanılıydı. Hastaların ortalama yürüme mesafesi 536,8±80,8 metre olarak bulundu. Hastalar, literatürde bildirilen beklenen mesafenin %73,7-%102,5'sini yürüdüler ve anlamlı bir yürüme kapasitesi azalması saptandı.

Sonuç: Bu çalışma, JİA hastalarında literatürdeki referans değerlere kıyasla yürüme kapasitesinde azalma olduğunu düşündürmektedir. Tedavi almakta olan hastalarda daha düşük yürüme kapasitesi gözlenmiş olsa da, bu bulgu endikasyona bağlı karıştırma ile ilişkili olabileceğinden temkinli yorumlanmalıdır. Bu ön bulgular, fiziksel aktivitenin JİA'da medikal tedaviye ek bir yaklaşım olarak değerinin ileri çalışmalarla araştırılmasını desteklemektedir.

Anahtar Kelimeler: juvenil idiyopatik artrit, pediatrik romatoloji, altı dakika yürüme testi, fonksiyonel kapasite

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INTRODUCTION

Juvenile idiopathic arthritis (JIA) is a chronic rheumatic disease characterized by arthritis of unknown origin that manifests before the age of 16 and persists for at least 6 weeks. It stands as the most prevalent and debilitating rheumatic disease in childhood, exhibiting various subgroups and distinct features. According to the International League of Associations for Rheumatology (ILAR) classification, JIA is stratified into 7 subtypes: systemic onset, oligoarticular, polyarticular rheumatoid factor (RF) positive, polyarticular RF negative, enthesitis-related, psoriatic, and undifferentiated arthritis (1, 2). The disease predominantly affects peripheral joints, and if left untreated, the chronic inflammation significantly limits the patient's mobility and productivity and induces chronic pain (3). Effective management and sustained remission of JIA necessitate a multidisciplinary team, comprising a pediatric rheumatologist, physiotherapist, ophthalmologist, orthopedic surgeon, child psychiatrist, and active involvement from the patient's family. The primary objectives of medical treatment include pain relief, suppression of disease activity, and restoration of restricted range of motion. As a chronic condition, JIA can persist into adulthood, causing joint dysfunction and physical disability. Lifelong diseases like JIA can adversely affect the patient's quality of life; thus, in addition to medical treatment, physiotherapy and lifestyle adjustments are recommended (4).

The 6-minute walking test (6MWT) is a widely used objective measure of functional walking capacity and is easily administered in clinical settings. Initially used in adults with cardiopulmonary disorders, this test is also utilized in various populations with reduced cardiovascular fitness and physical impairments, including children with cerebral palsy, cystic fibrosis, cancer patients, and juvenile systemic sclerosis (5-9). The 6MWT entails a standardized approach to measure the distance an individual can walk on a hard flat surface within 6 minutes. The physiological response to the test is considered submaximal and equivalent to intense exercise, highlighting its potential as a valuable clinical tool for measuring and monitoring functional submaximal exercise capacity (10, 11). Despite the utilization of the 6MWT in some studies involving children with JIA, limited data are available regarding the results of the 6MWT in JIA patients (12-15). Since the results of 6MWT studies conducted in patients with chronic medical conditions and disabilities were found to be different, studies involving specific patient populations are recommended (16).

In our study, we aimed to perform the 6MWT on patients with JIA, and to compare the age-and sex-specific data with the previous 6MWT outcomes reported in the literature for JIA patients.

MATERIAL AND METHOD

Between January 2023 and March 2023, a total of 30 patients, aged between 6 and 19 and diagnosed with JIA according to ILAR classification criteria (1), were enrolled in the study. To ensure good compliance, patients over the age of 6 and those without lower extremity pain were included. Patients with known cardiac, pulmonary, or neuromuscular comorbidities that could independently affect walking capacity were not present in this cohort based on clinical assessment at the time of testing. 30 patients were included in the study, but 1 patient could not complete the test because of leg pain during walking (**Figure 1**). No missing clinical or laboratory data were present for the remaining 29 patients included in the analysis. Information related to age at diagnosis, duration of treatment, treatments, and family history were obtained from the patients' files. Before the 6MWT, consent for the study was obtained from the parents of the patients. Patients were instructed to walk along a 30-meter hallway with a hard surface within the clinic, aiming for the fastest possible pace, for a duration of 6 minutes. Pulse rate, oxygen saturation, and blood pressure values were recorded before and after the test. Patients were informed that they could take a break if they experienced chest pain, leg pain, or shortness of breath during the test. Standardized verbal encouragement phrases, following the American Thoracic Society guidelines for the 6MWT (17), were provided to all patients at fixed 1-minute intervals throughout the test, along with periodic updates on the remaining time, to ensure consistency across assessments (18). The 6MWT was consistently administered by the same clinician on the same floor. The Juvenile Arthritis Disease Activity Score (JADAS) was utilized to assess disease activation and remission. The JADAS is a continuous disease activity score specific to JIA and comprising four parameters: active joint count, physician's global assessment of disease activity, parent/patient evaluation of the child's overall well-being, and erythrocyte sedimentation rate (ESR). The cutoff score for classifying a patient as having inactive disease was 1, while the cutoff for minimal disease activity was 2 for oligoarticular JIA and 3.8 for polyarticular JIA (19, 20).

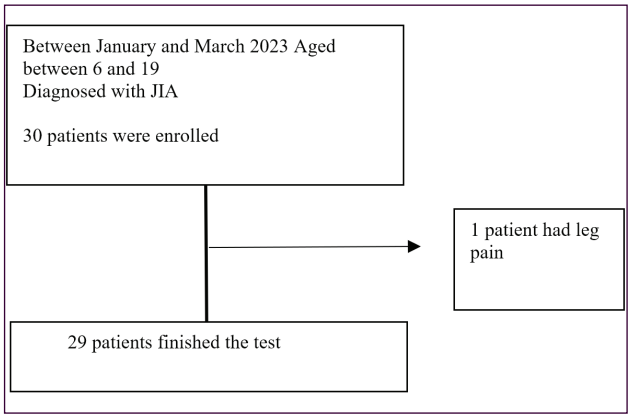

Figure 1. Inclusion and exclusion criteria of study

For each patient, the expected (predicted) 6MWT distance was calculated individually using the age- and sex-specific reference equations published in five previously validated pediatric 6MWT studies: Geiger et al. (ages 3-18, Austria) (21), Ben Saad et al. (ages 6-16, North Africa) (22), Chen et al. (ages 7-17, Taiwan) (23), Kasović et al. (ages 11-14, Croatia) (24), and Mian et al. (a JIA-specific reference derived from 120 children with JIA) (12). The measured 6MWT distance for each patient was then expressed as a percentage of the predicted distance from each reference equation, and patients were categorized as 'low' or 'normal' according to the cut-off values reported in the respective study. These five reference studies were selected because they are among the most frequently cited pediatric 6MWT reference equations in the literature, cover age ranges overlapping with our cohort (6-19 years), and — in the case of Mian et al. — provide a disease-specific benchmark derived from a JIA population, allowing comparison against both general pediatric and disease-specific reference values. No single reference study was designated as primary; comparisons against all five were reported in parallel to allow evaluation of the consistency of findings across different reference populations. As some reference equations were derived from narrower age ranges than our overall cohort (6-19 years) — such as Ben Saad et al. (6-16 years) and Kasović et al. (11-14 years) — predicted distance comparisons using these specific equations were restricted to patients falling within the corresponding age range; this explains the absence of comparative data for some patients in **Table 4**.

Upon collection of the patients' data, IBM SPSS Statistics 21 software was employed for statistical analysis. Descriptive statistics were presented as mean±standard deviation for normally distributed quantitative variables or as median for non-normally distributed variables. Categorical variables were expressed as numbers (percentages). For comparisons involving categorical variables, either the chi-square or Fisher's exact test was selected. A p-value of less than 0.05 was considered statistically significant. No a priori sample size or power calculation was performed. A post hoc sensitivity analysis indicated that, given the observed subgroup sizes, this study had 80% power (α=0.05) to detect only very large between-group differences (Cohen's h ≥ 1.1) (25) — for example, between treated (n=19) and untreated (n=10) patients, or between oligoarticular (n=22) and enthesitis-related arthritis (n=5) subgroups. Comparisons involving JIA subtypes represented by a single patient (RF-positive polyarticular JIA and psoriatic arthritis) could not be statistically tested due to insufficient sample size. Therefore, subgroup comparisons in this study should be regarded as exploratory, and non-significant findings should not be interpreted as evidence of equivalence between subgroups. To evaluate whether the association between treatment status and walking capacity persisted after adjusting for potential confounders, a multivariable linear regression analysis was performed with percent predicted walking distance (Mian et al. reference) as the dependent variable and treatment status, age, disease duration, JADAS score, and lower extremity involvement as independent variables. To account for multiple comparisons across the twenty statistical tests performed in **Table 4**, Benjamini-Hochberg false discovery rate (FDR) correction was applied; corrected p-values are reported alongside uncorrected values. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the institutional ethics committee. Ethics Committee approval was obtained from Gazi University with the research code 2022-1154.

RESULTS

The cohort comprised 16 females (55.2%) and 13 males (44.8%), with a median age of 14.7 years (range: 8-19 years). The median age at symptom onset was 9.3 years (range: 1-17 years). Subgroup analysis revealed that 22 patients (75.9%) had oligoarticular JIA, 5 patients (17.2%) had enthesitis-related arthritis, 1 patient (3.4%) had RF-positive polyarticular JIA, and 1 patient (3.4%) had psoriatic arthritis. Lower extremity involvement was observed in 27 patients (93.1%), with single-joint involvement in 9 patients (33.3%), two-joint involvement in 6 patients (22.2%), three-joint involvement in 2 patients (7.4%), four-joint involvement in 8 patients (29.6%), five-joint involvement in 1 patients (3.7%), and nine-joint involvement in 1 patient (3.7%). All patients were classified as in remission or mild disease based on the JADAS levels (**Table 1**).

Table 1. Patient characteristics, JIA diagnostic category of patients and lower limb involvement status.

Patient characteristics	Median (IQR)
Age	14.7 (6)
Age at diagnosis	9.3 (3.58)
JADAS-27	0 (1)
	n (%)
Sex	
Female	16 (55.2)
JIA diagnostic category	
Oligoarticular	22 (75,9)
Polyarticular	1 (3.4)
Enthesitis-related arthritis	5 (17.2)
Psoriatic arthritis	1 (3.4)
Lower limb involvement	
Yes	27 (93.1)
No	2 (6.9)

JADAS; The Juvenile Arthritis Disease Activity Score JIA; Juvenile Idiopathic Arthritis

To assess walking capacity, patients underwent a 6MWT. Pre-and post-walking measurements included pulse rate, blood pressure, and oxygen saturation (**Table 2**). Heart rate and both systolic and diastolic blood pressure increased significantly after the test (p=0.006, p=0.002, and p=0.018, respectively), whereas oxygen saturation did not change significantly (p=0.277), indicating that the test was well tolerated without evidence of desaturation. The magnitude of these physiological changes was moderate (Cohen's d=0.47–0.65), consistent with an expected submaximal exercise response. During the test, 4 patients (13.8%) reported leg pain, 3 patients (10.4%) experienced shortness of breath, and 1 patient (3.4%) reported both leg pain and shortness of breath. The mean walking distance achieved by the patients was 536.8±80.8 meters.

Age-and gender-specific predicted walking distances were compared with those reported in the literature (12, 21-24), revealing lower walking percentages in our patients (**Table 3**, **Figure 2**). Treatment modalities varied, with all the patients receiving non-steroidal anti-inflammatory drugs. Moreover, 26 patients (89.7%) were prescribed disease-modifying anti-rheumatic drugs, and 11 patients (37.9%) were undergoing biological therapy. Among participants, 19 patients (65.5%) were currently undergoing treatment, while 10 patients (34.5%) were in remission and not receiving medication for an average of 10.6 months (range: 1-26 months). When patients were classified into JIA subgroups, considering lower extremity involvement and the number of involved joints, no statistically significant difference was found according to predicted walking distances. After correction for multiple comparisons using the Benjamini-Hochberg procedure, none of the comparisons in **Table 4** — including those between treated and untreated patients based on Chen et al. and Mian et al. reference values — remained statistically significant (FDR-corrected p=0.353 for both). Patients in remission walked a median of 477.3 meters and patients with mild disease activity walked a median of 552.75 meters. Detailed comparisons of predicted walking distance percentages by treatment status and disease activity category, relative to published reference values, are presented in **Table 4** and discussed below. In multivariable linear regression analysis adjusting for age, disease duration, JADAS score, and lower extremity involvement, treatment status showed a trend toward higher percent predicted walking distance among treated patients (β=10.68, 95% CI-1.30 to 22.66, p=0.078), which did not reach statistical significance and was in the opposite direction from the unadjusted categorical comparison — a pattern consistent with confounding. When 6MWT results were further analyzed according to the number and location of involved joints, no statistically significant differences were observed (**Table 5**). Notably, the subgroup without lower extremity involvement was very small (n=2); given that the vast majority of patients (93.1%) had lower extremity involvement, this comparison should be interpreted with caution and provides limited additional information beyond the overall cohort findings.

Table 3. The percentage of predicted walking distances according to age groups and gender.

Study		% predicted walking distances of our patients (min-max)
Healthy children		
-Geiger et al. (21)	Ages 3-18 280 boys, 248 girls	80.2 (62.3-107)
-Ben Saad et al. (22)	Ages 6-16 100 boys, 100 girls	73.7 (58.1-95.3)
-Chen et al. (23)	Ages 7-17 382 boys, 380 girls	102.5 (82.7-139)
-Kasović et al. (24)	Ages 11-14 1471 boys, 2881 girls	93.5 (79.3-108)
JIA patients		
-Mian et al. (12)	120 JIA patients 85 girls, 35 boys Mean age 12.4	95.1 (76.9-133)

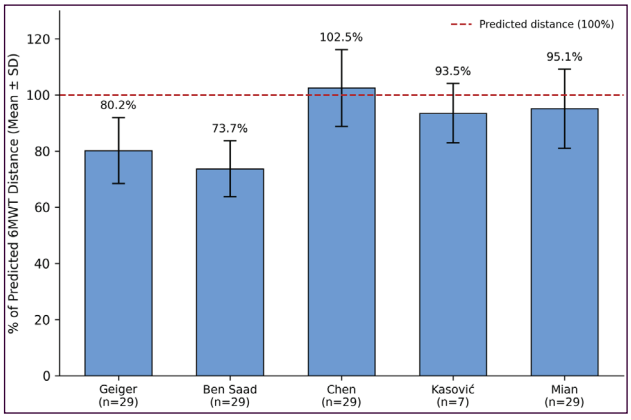

Figure 2. Percent of predicted 6-minute walk distance (mean±SD) according to five reference studies. The dashed line indicates 100% of predicted distance. Kasović comparison is based on n=7 patients within the applicable age range (11–14 years); all other comparisons are based on n=29.

Table 2. Mean values of pre- and post-test heart rate, blood pressure, and oxygen saturation.

Variable	Pre-test (Mean±SD)	Post-test (Mean±SD)	Mean Difference (95% CI)	Cohen's d	p
Oxygen saturation (%)	97.9±1.3	97.6±1.2	-0.3 (-0.8 to 0.2)	0.21	0.277
Heart rate (/min)	105.2±21.4	123.6±32.4	18.4 (6.4 to 30.4)	0.56	0.006
Systolic BP (mmHg)	107.4±11.8	113.3±12.2	5.9 (2.6 to 9.1)	0.65	0.002
Diastolic BP (mmHg)	68.6±7.8	72.6±9.3	4.0 (0.9 to 7.1)	0.47	0.018

SD; standard deviation, CI; confidence interval. p-values were calculated using the paired t-test. Cohen's d represents the standardized mean difference for paired samples.

Table 4. The comparison of predicted walking distance percentages based on juvenile idiopathic arthritis subgroups, treatment status, lower extremity involvement, and number of affected joints.

Group	n	Geiger		Ben Saad		Chen		Kasović		Mian		p value (uncorrected / FDR-corrected)
		Low	Normal	Low	Normal	Low	Normal	Low	Normal	Low	Normal	
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Treatment Status												
In remission (untreated)	10	8 (80)	2 (20)	10 (100)	-	3 (30)	7 (70)	0 (0)	2 (100)	4 (40)	6 (60)	0.215 / 0.636 - 0.023 / 0.353 0.053 / 0.353 0.036 / 0.353
Receiving treatment	19	18 (94.7)	1 (5.3)	19 (100)	-	14 (73.7)	5 (26.3)	4 (80)	1 (20)	15 (78.9)	4 (21.1)	
JIA Subtype												
Oligoarticular	22	20 (90.9)	2 (9.1)	22 (100)	-	11 (50)	11 (50)	2 (40)	3 (60)	13 (59.1)	9 (40.9)	0.856 / 0.951 - 0.387 / 0.645 0.147 / 0.636 0.589 / 0.867
Polyarticular	1	1 (100)	0	1 (100)	-	1 (100)	0			1 (100)	0	
ERA	5	4 (80)	1 (20)	5 (100)	-	4 (80)	1 (20)	2 (100)		4 (80)	1 (20)	
PsA	1	1 (100)	0	1 (100)	-	1 (100)	0			1 (100)	0	
Lower Extremity Involvement												
Yes	27	24 (88.9)	3 (11.1)	27 (100)	-	15 (55.6)	12 (44.4)	3 (50)	3 (50)	17 (63)	10 (37)	0.619 / 0.867 - 0.218 / 0.636 0.350 / 0.636 0.288 / 0.636
No	2	2 (100)		2 (100)	-	2 (100)		1 (100)		2 (100)		
Number of Affected Joints												
<4	18	15 (83.3)	3 (16.7)	18 (100)	-	9 (50)	9 (50)	2 (66.7)	1 (33.3)	11 (61.1)	7 (38.9)	0.268 / 0.636 - 0.273 / 0.636 1.000 / 1.000 0.694 / 0.867
≥4	11	11 (100)		11 (100)	-	8 (72.7)	3 (27.3)	2 (50)	2 (50)	8 (72.7)	3 (27.3)	
JADAS												
≤1	23	20 (87)	3 (13)	23 (100)	-	13 (56.5)	10 (43.5)	3 (60)	2 (40)	15 (65.2)	8 (34.8)	0.35 / 0.636 - 0.653 / 0.867 0.809 / 0.951 0.947 / 0.997
>1	6	6 (100)	0	6 (100)	-	4 (66.7)	2 (33.3)	1 (50)	1 (50)	4 (66.7)	2 (33.3)	

ERA; enthesitis-related arthritis, PsA; psoriatic arthritis, JADAS; The Juvenile Arthritis Disease Activity Score. p<0.05 is statistically significant. Uncorrected p-values were calculated using the chi-square or Fisher's exact test; FDR-corrected p-values were calculated using the Benjamini-Hochberg procedure across all twenty comparisons performed in this study. p-values correspond, in order, to Geiger, Ben Saad, Chen, Kasović, and Mian reference comparisons within each group.

Table 5. 6MWT Results According to Joint Involvement

Group	n	Walking distance, meters (Mean±SD)	% Predicted distance – Mian et al. (Mean±SD)	p
1-joint involvement	9	553.8±83.1	98.9±15.3	
2-joint involvement	6	545.0±114.7	97.5±17.8	
≥3-joint involvement	12	525.0±70.6	91.9±12.5	
Kruskal-Wallis test				0.587 (meters) / 0.502 (%)
Lower extremity involvement (+)	27	539.1±83.3	95.5±14.5	
Lower extremity involvement (–)	2	506.0±9.2	89.3±5.9	
Mann-Whitney U test				0.636

SD; standard deviation. p-values were calculated using the Kruskal-Wallis test for joint involvement groups and the Mann-Whitney U test for lower extremity involvement.

DISCUSSION

In our study, a 6MWT was conducted on 29 JIA patients, and the results indicated lower walking distances compared with JIA patients reported in the literature (12-15). Notably, patients who were still receiving treatment had significantly lower walking capacity than those whose treatment had been discontinued (compared with reference values reported by Chen et al. [p=0.023] (23) and Mian et al. [p=0.036] (12); **Table 4**). Notably, after correction for multiple comparisons across the twenty statistical tests performed in this study, this association did not remain statistically significant (FDR-corrected p=0.353), further supporting the exploratory nature of this finding. This finding should be interpreted with caution, as patients remaining on treatment are likely to differ systematically from those in remission in ways not captured in our analysis, such as greater disease severity, longer disease duration, or greater cumulative joint damage, a phenomenon known as confounding by indication. This discrepancy between the unadjusted categorical analysis and the adjusted continuous model further supports the interpretation that the observed association may be unstable and susceptible to confounding, rather than reflecting a robust causal relationship; therefore, this finding should not be interpreted as evidence that treatment itself reduces functional capacity. Interestingly, when walking distances were analyzed according to JADAS, the median walking distance of patients with mild disease activity was higher than that of patients in remission, although this difference did not reach statistical significance when compared with reference values from the literature (p=0.35–0.947 across four reference studies) (12, 21, 23, 24; **Table 4**). Furthermore, since all patients in our cohort were classified as being in remission or having only mild disease activity, the reduced walking capacity observed cannot be attributed to active inflammatory disease alone; potential contributing factors, including the psychological impact of ongoing medication use, parental or self-imposed activity restriction, physical deconditioning, fear of movement, reduced habitual physical activity as reported in prior JIA cohorts (26-29), and differences in body composition — were not directly assessed in this study and remain speculative. Physical activity nonetheless remains important for JIA patients' overall participation in daily life and has been shown to reduce inflammation, as reflected by decreased calprotectin levels in the study by Rochette et al. (30); future studies incorporating validated psychological, kinesiophobia, and physical activity measures are needed to clarify the relative contribution of these factors to functional capacity in JIA.

Interestingly, dyspnea during the test was noted in some patients despite normal pulmonary examinations, suggesting that functional capacity, rather than physical examination findings, contributed to the experience of breathlessness. In addition, as shown in **Table 2**, although there was no change in oxygen saturation, 4 of our patients had shortness of breath. This finding suggests that reduced functional capacity may be more prevalent than anticipated in our patient population, irrespective of physical examination findings; however, as pulmonary function was not formally assessed in this study, this interpretation remains speculative. Preemptive chest evaluation and breathing exercises may be considered in these patients even in the absence of overt pulmonary involvement, pending confirmation in studies incorporating formal pulmonary assessment.

In our study, patients without lower extremity involvement also did not reach the walking distances predicted from reference values reported in the literature, which may reflect the fear-avoidance and parental overprotection patterns discussed above; Woolnough et al. similarly reported fear of movement among JIA patients (31). Evaluating patients' concerns and fears from the time of initial diagnosis may therefore be a valuable component of clinical care, pending further investigation.

When patients were classified into JIA subgroups, no statistically significant difference was found in predicted walking distances. This finding should be interpreted with caution: the overall sample size was small (n=29), and the distribution across JIA subtypes was highly uneven, with only one patient each in the RF-positive polyarticular JIA and psoriatic arthritis subgroups. As no a priori power calculation was performed, these subgroup comparisons were likely underpowered, and the absence of statistically significant differences should not be interpreted as evidence of equivalence between subgroups. Larger, adequately powered studies are needed to confirm these exploratory findings.

This study has several limitations. Most importantly, walking capacity was not compared with a contemporaneous, locally recruited healthy control group; instead, comparisons were made with previously published reference values obtained from different countries and populations. As 6MWT performance can be influenced by ethnicity, population-specific characteristics, testing protocols, and other factors, these comparisons should be interpreted with caution, and this represents the major limitation of our study. Additional limitations include the small sample size and cross-sectional design, which limit the generalizability of the findings and the statistical power of subgroup analyses. In addition, as this was a single-center, clinic-based cohort in which only patients who were able to attend the outpatient visit and cooperate with testing were included, selection bias cannot be excluded; patients with more severe functional limitations or those unable to complete the test may be underrepresented, potentially affecting the generalizability of our findings.

Furthermore, the evaluation of walking capacity occurred during a single outpatient clinic admission without pre-and post-treatment assessments. Future studies incorporating a local healthy control group, larger cohorts, and longitudinal follow-up are needed to provide more robust evidence on walking capacity in JIA patients and the impact of different treatment approaches. Given these limitations, the present findings should be regarded as preliminary and exploratory rather than definitive, and are intended to generate hypotheses for future, more rigorously controlled studies rather than to establish causal relationships between JIA, treatment, and functional capacity.

CONCLUSION

In our study, JIA patients walked shorter distances than the reference values reported for healthy children in the literature, even when their lower extremity joints were not affected. Furthermore, JIA patients who continued treatment showed lower walking capacity than patients who had entered remission and discontinued treatment, although this finding may be influenced by confounding by indication, as discussed above. These findings suggest that, in chronic diseases such as JIA, both the physical and potential psychological effects of the disease should be considered when developing treatment plans. As physical activity and exercise capacity were not directly assessed as an intervention in this study, our findings do not permit direct conclusions regarding the benefits of exercise programs; rather, they support further investigation into physical activity as a potential adjunct to medical treatment in JIA. Such an integrated approach may hold potential to improve the overall quality of life of individuals affected by JIA, pending confirmation in future prospective studies.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study was approved by Gazi University Ethics Committee (Date: 08.11.2022; Decision no: 18).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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